

No.

200000158



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

South Dakota Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE VARIETY. (34 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Ember'

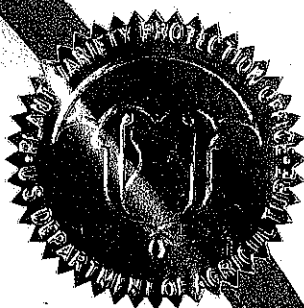
In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twelfth day of September, in the year two thousand one.

Attest:

Paul M. Johnson

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

W. H. Henshaw
Secretary of Agriculture



REPRODUCE LOCALLY. Include form number and date on all reproductions

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426)

1. NAME OF OWNER SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME SD 3219		3. VARIETY NAME Ember	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) SOUTH DAKOTA STATE UNIVERSITY AG HALL 129 BROOKINGS, SD 57007		5. TELEPHONE (include area code) (605) 688-4149		FOR OFFICIAL USE ONLY PVPO NUMBER 200000158	
6. FAX (include area code) (605) 688-6065		7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) AGRICULTURAL EXPERIMENT STATION		8. IF INCORPORATED, GIVE STATE OF INCORPORATION N/A	
9. DATE OF INCORPORATION N/A		10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION (First person listed will receive all papers) DR. JACKIE RUDD, SPRING WHEAT BREEDER SOUTH DAKOTA STATE UNIVERSITY PLANT SCIENCE DEPARTMENT NPB 244D, BOX 2140-C BROOKINGS, SD 57007-2141		FILING AND EXAMINATION FEES: \$ 2450 DATE 2/15/00 CERTIFICATION FEE: \$ 3200 DATE 8/27/01	
11. TELEPHONE (include area code) (605) 688-4769		12. FAX (include area code) (605) 68804452		13. E-MAIL jackie_rudd@sdstate.edu	
14. CROP KIND (Common Name) spring wheat		15. FAMILY NAME (Botanical) Gramineae		16. GENUS AND SPECIES NAME OF CROP Triticum aestivum L.	
17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)			
18. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act. <input checked="" type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input type="checkbox"/> NO (If "no", go to item 22)		19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
20. IF "YES" TO ITEM 20, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED		21. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
22. IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)					
The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.					
The undersigned owner(s) is(are) the owner of this variety reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42.					
Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF OWNER 		SIGNATURE OF OWNER			
NAME (Please print or type) DR. KEVIN KEPHART		NAME (Please print or type)			
CAPACITY OR TITLE DIRECTOR, SDAES		DATE 2-4-2000		CAPACITY OR TITLE	
DATE		DATE		DATE	

EXHIBIT A.
Ember (SD3219)
Origin and Breeding History of the Variety

Ember is an F_4 derived line from the cross 'Guard/Sharp//Grandin' made at Brookings, South Dakota in 1989. The F_1 plants were grown at Yuma, Arizona during the winter of 1990-1991. Individual F_2 plant selections were made at Brookings, South Dakota in 1991 and were grown at Yuma, Arizona the following winter (1991-92) as plant rows. The plant rows at Yuma were harvested as rows and used to plant $F_{2.4}$ yield trials and a space planted nursery at Brookings in 1992. Based on data collected from the yield trials, individual plants were selected within the selected populations. Populations were selected based on grain yield, grain volume weight, and bread-making characteristics and individual plants were visually selected for resistance to prevalent foliar pathogens (viz. leaf rust and stem rust). Plant rows were grown in Yuma during the winter (1992-93) and $F_{4.6}$ yield trials were conducted at Brookings in 1993. Based on the yield performance and the disease resistance, it was promoted to first year replicated yield trial in 1994 with an experimental designation of SD3219. Seed increase was conducted by the South Dakota Spring Wheat Breeding Program from 1994 through 1996. Breeders' seed was produced in 1997 and Foundation seed was produced in 1998.

Ember was tested by the South Dakota Spring Wheat Breeding Program from 1994 through 1998 and in Crop Performance Trial (CPT) and the Uniform Regional Spring Wheat Nursery from 1996 through 1997. It was tested by the Wheat Quality Council (WQC) in 1997 and 1998.

Ember has been uniform and stable for all morphological characters during the past four generations of selfing and increase. A tall variant (12 cm taller) was identified in the 1998 foundation seed fields at a frequency of 0.03% and at a similar frequency in 1999 foundation seed fields. Up to 0.1% variant plants may be encountered in subsequent generations. The variants were slightly different than the general population with respect to protein banding pattern, but were similar in other morphological characters.

EXHIBIT B.
Ember (SD3219)
Statement of Distinctness

Ember is most similar to the hard red spring wheat cultivars 'Forge' and 'Russ', but differs in the following characteristics:

Test Weight: Ember has 2 LB/Bu lower test weight than Forge and Russ, when recorded directly from combine (Table 1).

Heading: Ember is two days later than Forge but is similar to Russ (Table 1).

Polyacrylamide Gel Electrophoresis (PAGE): Polyacrylamide Gel Electrophoresis revealed that Ember differs from Forge and Russ by at least three protein-bands (Photograph 1). The first and second arrows on the photograph point to bands that are present in Ember, but missing in Forge and Russ. The third arrow points to a band that is missing in Ember and Russ, but present in Forge. Dr. Brent Turnipseed, Seed Testing Lab, South Dakota State University, conducted PAGE using the protocol developed by Davis (1964) and modified later. The complete protocol is attached.

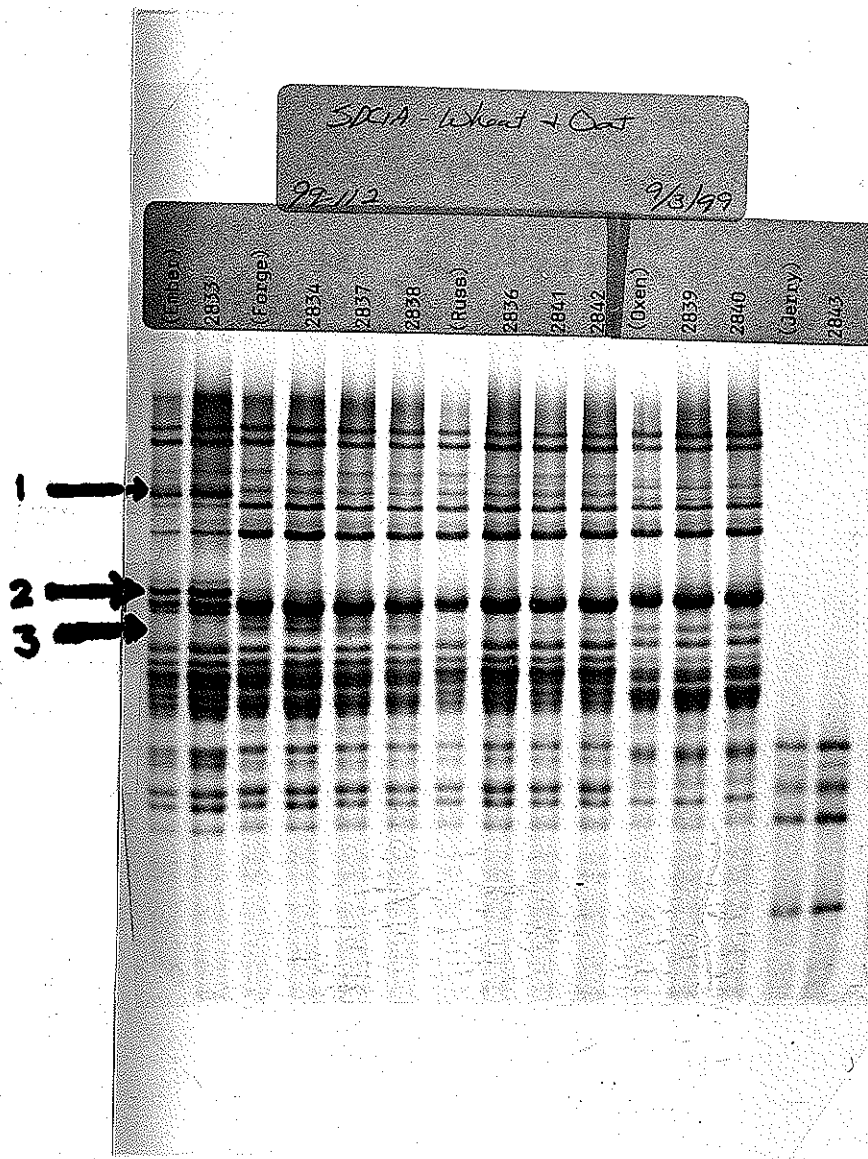
Davis, B. 1964. Disc electrophoresis. II. Method and application to human serum protein. Ann. New York Acad. Sci. 121: 404-427.

Table 1. South Dakota State University, Spring Wheat Breeding Trials Combined over Locations and Years.

	Grain Yield (bu/a)				Test Weight (lb/bu)				Plant Height (cm)				Heading (days)			
	1996 (9)	1997 (7)	1998 (7)	96-98 (23)	1996 (8)	1997 (7)	1998 (6)	96-98 (21)	1996 (7)	1997 (4)	1998 (3)	96-98 (14)	1996 (7)	1997 (5)	1998 (6)	96-98 (18)
Ember	59.5	41.9	43.9	49.4	61.1	54.2	51.7	56.1	86.2	78.9	83.8	83.6	180.1	179.8	173.8	177.9
Forge	55.3	42.0	43.3	47.6	62.1	56.3	54.2	57.9	85.0	77.1	87.0	83.2	178.5	177.8	170.7	175.7
Russ	56.6	44.1	42.9	48.6	61.3	57.8	54.8	58.3	88.2	80.4	84.6	85.2	180.8	180.3	173.9	178.4
CV%	6.7	6.7	7.8	7.2	1.4	2.4	3.7	2.8	3.7	2.3	3.0	3.3	0.5	0.4	0.5	0.5
LSD (5%)	3.4	2.9	3.5	1.9	0.8	1.5	2.3	1.0	3.5	2.6	4.3	2.1	0.9	1.0	1.0	0.6

N. B.: Figures in parentheses indicate the number of locations that data was collected from.

Photograph 1. Acid Polyacrylamide Gel Electrophoresis (PAGE) of hard red spring wheat cultivars Ember, Forge, and Russ.





PROCEDURE FOR POLYACRYLAMIDE GEL ELECTROPHORESIS

Written by J. Schneider
and T. Machacck 1988
Revised 1989 by J. Johnson
Revised 1991 by L. Fleege

This paper is written with the intent of passing on some practical information to laboratories which are interested in using polyacrylamide gel electrophoresis (PAGE) for the analysis of varietal purity of seed lots. Perhaps the practical experience we have gained from organizing and implementing our system will be of some assistance.

The lists which have been compiled are quite comprehensive of the needs for setting up a laboratory for PAGE. Personal preference may dictate changes in the glass and hardware, however the items listed seem to work the best for us. The equipment listed is essential for producing clear and reproducible results.

The chemical sources listed are those recommended to us (Lookhart et al., 1981) as the ones that produce the best results. Aluminum Lactate quality is important; it should be pure white (powdered sugar color). Impure Aluminum Lactate will result in blurred electrophorograms.

Reference samples of foundation seed (one pound) of each variety to be tested were collected and stored in plastic containers.

Thirty gram samples are collected in Udy bottles following purity testing. 100 seeds counted from each sample are ground in a small coffee grinder (Miracle Mill) and sifted through a 1.016 sieve. Use caution to avoid contamination between samples. Cleaning the grinder and sieve with forced air between samples is recommended.

PROTEIN EXTRACTION

Using a fine point marking pen, mark a 1.5 ml centrifuge tube for each sample. Wheat into each tube, add 750 μ l of Ethylene glycol and 0.25 g of flour. Extractions mix easier if the ethylene glycol is put in the tube first. Vortex the samples and wait an hour before centrifuging. Oat: into each tube, add 700 μ l of ethylene glycol and 0.30 g of flour. Vortex the samples and wait one hour before centrifuging. Single Seed: Crush each seed between weighing paper with a pliers. Place each into centrifuge tubes with 100 μ l of ethylene glycol and allow to set 1 hour. Load the centrifuge evenly. Run it on low speed (4500 x g recommended) for 10 minutes. [Optional: Add one drop of 10% methyl green dye (1 g methyl green brought to a volume of 10ml with H₂O) to each sample with a small sized auto pipette].

MIXING THE GEL SOLUTION

Each 1.5 mm thick gel will require 50 ml of gel solution. Use a 125 ml vacuum flask with stopper when mixing 100 ml of gel solution. Into the flask add each of the following. **Note:** when working with the gel solution wear gloves and a mask as acrylamide is a neurotoxin until it has solidified.

For two gels: Aluminum Lactate (0.25g); Ascorbic Acid (0.024g); $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (200 μ of 10mg/10ml mixed fresh);
Wheat: Bis-Acrylamide (0.25g), Acrylamide (6.00g);
Oat: Bis-Acrylamide (0.4g), Acrylamide (7.50g). Add distilled water to obtain a volume of 100ml.

Add a stir bar, stopper the flask, and place on the stirrer at slow speed, connect the vacuum and allow it to stir for 20 minutes. (The vacuum step is optional.) After this time is up, allow the solution to continue stirring while the pH is checked and adjusted. Lower the pH to 3.1 by titrating with Lactic Acid. If the pH is over adjusted, Trizma base (5M) can be used to increase the pH without adverse effects. Divide the solution into 2 portions in 100ml flasks containing stir bars.

Prepare the gel plates making sure that they are tightly sealed to the rubber gaskets. (This is very important but easy to forget).

Place one of the flasks containing gel solution on the stir plate at very slow speed. Note: excessive agitation mixes in oxygen which ties up the catalyst and prevents complete polymerization. Add 25 μ l of H_2O_2 and allow to stir for 45 seconds. Carefully pour the solution between the plates until it is 1/4" from the top. Insert the gel comb making sure there are no bubbles trapped on the well ends. Repeat the procedure for the other gel and allow both to polymerize for 15 minutes.

TANK BUFFER

While waiting for the gel to polymerize, mix the tank buffer. Place 5.625 g of Aluminum Lactate in a 4000 ml flask. Fill the flask to approximately 4500 ml (middle of the neck on a 4000 ml flask) with distilled H_2O and stir. While the buffer stirs, check the pH. Titrate to 3.1 using Lactic Acid.

SAMPLE PLACEMENT

By this time the gel should be polymerized. Carefully remove the gel comb. Careless removal can cause suction, pulling the gel walls together and possibly breaking them. Pipette out any excess fluid in the slots using a long needle syringe. If the walls of the gel are crooked, they can be straightened at this time with the needle. Fill the slots about 2/3 full with buffer solution. Then, using a digital pipette, place 7.5 μ l of the sample extract (12 μ l for single seeds) into the slots. The extract should sink to the bottom. Using a pasteur pipette finish filling the slots with buffer.

RUNNING THE GEL

Attach the upper buffer chamber to the gel plates making sure of a tight seal. Fill the upper buffer chamber with buffer one inch from the top. Pour the remaining buffer into the lower buffer chamber along with the stir bar. Set the tank on a stir plate and set the stir plate to a fast speed. This aids in maintaining an even temperature during the run.

Put the apparatus together. Make sure that the cathode is connected to the lower buffer and the anode to the top. Start the water bath and set it for 15C. Set the power source to constant current, switch it on and turn power up to 500 volts. The amperage, when running two gels, should initially read approximately 160 to 170 ma. Allow it to run 2

hours for wheat and oats.

MIXING THE STAINING SOLUTION

Take safety precautions to prevent eye and skin contact when working with the acid solutions. To make 600 ml of stain, mix in a 1000 ml flask the following: 100 grams TCA and 600 ml distilled H₂O. Add 20 ml of 1% Comassie brilliant blue (CBB) solution (1g CBB per 100ml ETOH).

REMOVING THE GELS

After 2 hours turn the power off and remove the gel plates. Remove the spacers and pry the plates apart (It is recommended using one of the spacers for this task. Take care as to not damage the spacer in the process). To keep track of the slot order, cut off the lower left hand corner. Then remove the slot fringes. The gel can then be loosened by running a spatula between it and the glass plate while squirting water in the gap created by the spatula. The gel should slide off into the staining pan (be sure to label the pan).

STAINING

Remove any excess water and add 300ml of stain. Place the trays on a shaker at gentle speed and allow them to stain for at least 4-6 hours. Over staining will not harm the gels or their results. Sometimes overnight staining is more convenient.

DESTAINING

Remove the stain (A handy way to remove liquids is with the vacuum pump. Put a catch bottle in the line and use a pasteur pipette in the hose end.) Add 300ml of H₂O to the tray. Put the trays on the shaker and allow to destain for 2-6 hours or whatever is necessary for acceptable results. A useful tool for moving the gel is a piece of plastic 11" x 6" from a report cover. Use the plastic sheet to place the gels into one quart zip-lock freezer bags.

CLEANING THE GEL PLATES

For easy and flawless removal of the gels, a thorough cleaning of the plates is essential. Wash them well with soapy water. Then wipe them down with ammonia glass cleaner or ethanol. Put the glass together with the spacers and clamps making sure that everything is flush on the bottom. Put them in the stand, insert the combs, and cover with plastic wrap. They are now ready for the next use.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S)

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code)

SOUTH DAKOTA STATE UNIVERSITY
AG HALL 129
BROOKINGS, SD 57007

FOR OFFICIAL USE ONLY

PVPO NUMBER

VARIETY NAME

EMBER

TEMPORARY OR EXPERIMENTAL
DESIGNATION

SD 3219

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. or) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____

Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

1

1=Common

2=Durum

3=Club

4=Other (SPECIFY) _____

2. VERNALIZATION:

1

1=Spring

2=Winter

3=Other (SPECIFY) _____

3. COLEOPTILE ANTHOCYANIN:

1

1=Absent

2=Present

4. JUVENILE PLANT GROWTH:

2

1=Prostrate

2=Semi-erect

3=Erect

5. PLANT COLOR (boot stage):

2

1 = Yellow-Green

2 = Green

3 = Blue-Green

6. FLAG LEAF (boot stage):

2

1 = Erect

2 = Recurved

2

1 = Not Twisted

2 = Twisted

7. EAR EMERGENCE:

0 1

Number of Days Earlier Than 2375

0 2

Number of Days Later Than Forge

8. ANTHR COLOR:

1

1 = YELLOW

2 = PURPLE

9. PLANT HEIGHT (from soil to top of head, excluding awns):

0 3

cm Taller Than 2375

1 2

cm Shorter Than Chris

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10. STEM:

A. ANTHOCYANIN

☒ 1 = Absent 2 = Present

B. WAXY BLOOM

☒ 2 = Absent 2 = Present

C. HAIRINESS (last internode of rachis)

☒ 2 = Absent 2 = Present

D. INTERNODE (SPECIFY NUMBER) 4 (including peduncle)

☒ 1 = Hollow 2 = Semi-solid 3 = Solid

E. PEDUNCLE

☒ 2 = Absent 2 = Present

☒ 47 cm Length

11. HEAD (at Maturity):

A. DENSITY

☒ 2 = Lax 2 = Middense 3 = Dense

B. SHAPE

☒ 1 = Tapering 2 = Strap 3 = Clavate 4 = Other (SPECIFY) _____

C. CURVATURE

☒ 2 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS

☒ 4 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

12. GLUMES (at Maturity):

A. COLOR

☒ 1 = White 2 = Tan 3 = Other (SPECIFY) _____

B. SHOULDER

☒ 2 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK

☒ 3 = Obtuse 2 = Acute 3 = Acuminate

D. LENGTH

☒ 2 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

E. WIDTH

☒ 2 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm) 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

☒ 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK

☒ 2 = Rounded 2 = Angular

C. BRUSH

☒ 2 = Short 2 = Medium 3 = Long

D. CREASE

☒ 2 = Width 60% or less of Kernel
 2 = Width 80% or less of Kernel
 3 = Width Nearly as Wide as Kernel

☒ 1 = Not Collared 2 = Collared

☒ 2 = Depth 20% or less of Kernel
 2 = Depth 35% or less of Kernel
 3 = Depth 50% or less of Kernel

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USDA-ARS

13. SEED: (continued)

E. COLOR

☐ 3

1 = White

2 = Amber

3 = Red

4 = Other (SPECIFY) _____

F. TEXTURE

☐ 1

1=Hard

2=Soft

G. PHENOL REACTION (see instructions):

☐

1 = Ivory

2 = Fawn

3 = Light Brown

4 = Dark Brown

5 = Black

14. DISEASE:

(0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

Stem Rust (*Puccinia graminis* f. sp. *tritici*)☐ 3moderately resistant field reaction;
See Table 3.1 for seedling reaction.Leaf Rust (*Puccinia recondita* f. sp. *tritici*)☐ 3

field reaction

Stripe Rust (*Puccinia striiformis*)☐ 0Loose Smut (*Ustilago tritici*)☐ 0Tan Spot (*Pyrenophora tritici-repentis*)☐ 3Flag Smut (*Urocystis agropyri*)☐ 0Halo Spot (*Selenophoma donacis*)☐ 0Common Bunt (*Tilletia tritici* or *T. laevis*)☐ 0

Septoria nodorum (Glume Blotch)

☐ 0Dwarf Bunt (*Tilletia controversa*)☐ 0

Septoria avenae (Speckled Leaf Disease)

☐ 0Karnal Bunt (*Tilletia indica*)☐ 0

Septoria tritici (Speckled Leaf Blotch)

☐ 0Powdery Mildew (*Erysiphe graminis* f. sp. *tritici*)☐ 0Scab (*Fusarium* spp.)☐ 3

"Snow Molds"

☐ 0

"Black Point" (Kernel Smudge)

☐ 0Common Root Rot (*Fusarium*, *Cochliobolus* and *Bipolaris* spp.)☐ 0

Barley Yellow Dwarf Virus (BYDV)

☐ 0Rhizoctonia Root Rot (*Rhizoctonia solani*)☐ 0

Soilborne Mosaic Virus (SBMV)

☐ 0Black Chaff (*Xanthomonas campestris* pv. *translucens*)☐ 0

Wheat Yellow (Spindle Streak) Mosaic Virus

☐ 0Bacterial Leaf Blight (*Pseudomonas syringae* pv. *syringae*)☐ 0

Wheat Streak Mosaic Virus (WSMV)

☐ 0

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

Other (SPECIFY) _____

☐

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

Hessian Fly (*Mayetiola destructor*)

☐ 1

Other (SPECIFY) _____

☐

Stem Sawfly (*Cephus* spp.)

☐ 0

Other (SPECIFY) _____

☐

Cereal Leaf Beetle (*Oulema melanopa*)

☐ 0

Other (SPECIFY) _____

☐

Russian Aphid (*Diuraphis noxia*)

☐ 0

Other (SPECIFY) _____

☐

Greenbug (*Schizaphis graminum*)

☐ 0

Other (SPECIFY) _____

☐

Aphids

☐ 0

Other (SPECIFY) _____

☐

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

00 FEB 15 P1:09

USDA-ARS PARD
RECEIVED

EXHIBIT D.
Ember (SD3219)
Additional Description of the Variety

The following additional descriptive information is presented:

- Release notice of Ember
- Table 2. South Dakota performance data.
- Table 3. Uniform Regional Spring Wheat performance data.
- Table 3.1. Seedling reaction of 1996 Uniform Hard Red Spring wheat Nursery to selected isolates of stem rust.
- Table 4. 1997 Wheat Quality Council data.
- Table 5. 1998 Wheat Quality Council data.



200000158
College of Agriculture and
Biological Sciences

Agricultural Experiment Station

Office of the Director

Box 2207, Ag Hall 129
SDSU
Brookings, SD 57007-0291
Phone 605-688-4149
FAX 605-688-6065

DATE: May 5, 1999

TO: Agricultural Experiment Station Directors
North Central Region and Great Plains

FROM: Kevin D. Kephart, Acting Associate Director
Agricultural Experiment Station

SUBJECT: Release of Cultivars

The South Dakota Agricultural Experiment Station announces the release of the following cultivars:

- 1) ~~SD3219 Hard Red Spring Wheat - Proposed name 'Ember'; PVP recommended~~
- 2) SD93-522 Soybean - Proposed name 'Turner'; PVP recommended
- 3) SD203 Corn - Inbred release tested as 980006
- 4) SD206 Corn - Inbred release tested as 980041
- 5) SD207 Corn - Inbred release tested as 980051
- 6) SD208 Corn - Inbred release tested as 980056
- 7) SD211 Corn - Inbred release tested as 980086
- 8) SD212 Corn - Inbred release tested as 980096
- 9) SD82* Corn - Inbred release tested as 980701
- 10) SDR17 Sunflower - Fertility restorer germplasm
- 11) SDR18 Sunflower - Fertility restorer germplasm
- 12) SDR19 Sunflower - Fertility restorer germplasm

*Denotes white endosperm

The release date is March 1, 1999.

The South Dakota Agricultural Experiment Station also announces the following increases with intent to release:

- 1) SD94160 Oat (intended for release in 2000)
- 2) CI3404 Flax (intended for release in 2000)
- 3) SD3407 Hard Red Spring Wheat (intended for release in 2000)
- 4) SD3414 Hard Red Spring Wheat (intended for release in 2000)

There were no winter wheat releases last year, but the following winter wheat experimental lines were increased in 1998 with intent to release:

- 1) SD92107 Hard Red Winter Wheat (intended for release in 1999)
- 2) SD93267 Hard Red Winter Wheat (intended for release in 1999)

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Release of 'Ember' Hard Red Spring Wheat

Ember was developed by the South Dakota Agricultural Experiment Station and tested under the experimental designation of SD3219. It is an early, standard height hard red spring wheat from the cross Guard/Sharp//Grandin. It is anticipated that Ember will be submitted for cultivar protection under the United States Plant Variety Protection Act with the certification option.

Ember has been in South Dakota yield trials since 1995 and regional trials in 1996 and 1997. It can best be described as a transitional cultivar. It has better scab tolerance than currently grown cultivars (similar to 'Ingot') but is not highly resistant. Based on South Dakota yield trials, Ember yields three bushels per acre more than Ingot and similar to 'Russ' and 'Oxen'. Ember is early in maturity (same as 'Butte 86') and the average plant height is 3 cm shorter than Butte 86. It is moderately resistant to the prevalent races of stem and leaf rust. The scab tolerance of Ember is similar to Ingot, but is less than 'BacUp'. Ember has an excellent test weight on a clean basis but is sometimes hard threshing. The Wheat Quality Council data indicates that the bread-making properties of Ember are acceptable. Wheat and flour protein content averages 1% lower than Grandin. Mixing time and mixing tolerance are similar to Grandin.

Table 2. South Dakota performance data, 1998.

Entry	Name	Yield (bu/a)							TW lb/bu	Heading days	Ht cm	Scab %	97-98 Yield
		BRK	GRO	WAT	HIG	SEL	DAY	Average					
12	SD3310	52.9*	45.6*	55.9*	42.2	56.9*	55.4*	51.5*	54.6	170	86	41.1	48.1
25	SD3411	53.2*	42.6*	56.2*	44.5*	49.1	48.3	49.0	54.3	171	84	55.9	
18	SD3355	46.8	45.3*	48.8	46.6*	54.6*	49.6	48.6	55.3	172	90	67.7	46.3
11	SD8119	53.3*	43.4*	51.5	44.5*	46.0	50.8	48.2	54.2	173	85	70.2	46.8
14	SD3348	51.8*	38.3	50.6	47.0*	50.0	51.6	48.2	56.7	172	84	61.9	46.4
19	SD3367	52.2*	39.5	53.4*	48.5*	48.2	46.5	48.1	55.0	171	84	47.9	45.0
16	SD3335	52.6*	43.4*	50.3	41.8	48.4	51.0	47.9	55.5	171	89	54.2	46.0
9	SD3219	46.5	38.6	50.8	45.2*	50.4	55.0*	47.7	51.7	173	84	53.9	44.8
34	SD3455	42.3	46.9*	48.2	43.7*	52.1	50.3	47.3	55.1	170	86	51.1	
13	SD3345	49.4	40.9	52.7	46.4*	42.7	50.9	47.1	58.0	171	89	65.1	45.3
20	SD3390	43.6	41.3	49.6	45.2*	48.7	49.8	46.4	53.9	170	84	57.9	44.1
7	FORGE	44.6	39.5	47.2	43.1	49.3	54.2*	46.3	54.2	169	87	60.9	44.2
6	OXEN	50.4*	36.5	45.1	41.5	52.9*	50.1	46.1	55.3	172	80	68.4	45.2
5	RUSS	52.9*	38.5	49.5	42.1	47.0	46.6	46.1	54.8	173	85	61.9	45.1
36	SD3458	47.3	42.9*	45.9	41.1	52.4	46.3	46.0	54.2	177	99	57.9	
23	SD3407	49.4	41.8	47.9	44.3*	45.9	45.1	45.7	54.6	171	86	43.2	
17	SD3337	48.4	39.1	53.7*	42.3	44.5	45.0	45.5	56.9	171	89	59.9	43.9
10	SD8108	46.4	46.3*	47.5	38.3	43.7	49.1	45.2	56.6	172	88	65.6	44.2
33	SD3437	50.4*	41.2	45.7	44.2*	44.9	42.6	44.8	56.0	173	89	65.6	
8	INGOT	45.7	40.4	47.2	41.6	42.6	51.4	44.8	58.9	170	88	54.2	42.8
27	SD3414	48.5	40.9	49.9	40.6	42.0	46.7	44.8	54.9	169	81	39.7	
2	BUTTE 86	48.2	35.1	49.7	45.9*	45.2	44.6	44.8	53.7	170	84	59.7	42.7
28	SD3417	49.0	37.7	46.5	40.0	46.7	45.2	44.2	47.1	175	87	61.7	
15	SD3356	46.4	39.5	40.1	40.4	48.7	48.6	44.0	56.1	172	77	67.1	43.5
29	SD3419	49.3	35.9	44.3	39.7	47.1	47.2	43.9	57.6	172	89	52.9	
21	SD3400	48.2	35.9	49.7	40.4	42.0	46.0	43.7	58.2	171	86	52.6	
22	SD3405	49.6	36.8	46.9	39.1	47.0	42.8	43.7	56.8	174	83	54.4	
3	SHARP	46.6	37.5	46.2	38.1	43.8	48.7	43.5	54.2	170	84	73.1	41.4
31	SD3429	49.1	36.8	41.8	40.7	47.1	44.4	43.3	53.8	172	87	61.6	
30	SD3423	47.9	37.6	47.9	41.3	43.3	40.8	43.1	56.7	169	83	42.4	
35	SD3457	47.5	36.1	45.7	44.1*	44.8	40.6	43.1	53.1	172	77	74.2	
32	SD3430	46.8	34.7	46.6	40.3	43.6	37.8	41.6	57.3	173	90	54.1	
24	SD3410	50.5*	30.4	43.7	43.3*	42.1	39.7	41.6	56.2	171	83	51.1	
4	2375	47.9	30.5	41.6	41.9	42.9	43.1	41.3	56.0	173	83	62.7	39.8
26	SD3412	44.6	34.6	35.4	29.0	44.3	41.5	38.2	55.0	173	93	47.9	
1	CHRIS	32.0	23.4	24.0	31.0	29.7	25.8	27.7	47.1	178	99	68.4	28.4
Mean		48.1	38.8	47.2	41.9	46.4	46.5	44.8	55.0	172	86		
LSD (.05)		2.9	4.9	3.0	5.0	4.0	3.9	1.5					
C.V. (%)		3.7	6.2	3.9	7.4	5.2	5.1	5.2					

BRK=Brookings

HIG=Highmore

DAY=Day County

SEL=Selby

GRO=Groton

WAT=Watertown

Scab data is from 1998 inoculated nursery.

Table 3. Uniform Regional Spring Wheat performance data, 1996-97.

2000001587

VARIETY OR STATE NO. NO. LOCS:	YIELD BU/AC	TWT LB/BU	HD DAYS	HT CM	LD	PROT
	31	30	29	31	10	6

MN93413	57.1	57.9	33	78	2.4	13.0
SBE0050	54.6	59.0	31	73	1.8	13.9
ND695	53.2	59.6	30	77	1.6	14.8
ND691	52.6	58.1	33	85	1.8	14.0
SBF0402	51.4	59.6	30	73	1.3	15.0
SD3219	51.4	60.5	28	77	2.2	13.9
ND694	51.2	60.7	30	85	1.5	14.9
SD8108	50.9	60.5	27	82	2.4	14.2
T801.93	49.9	58.5	31	73	1.5	13.8
SDM50005	48.4	58.7	32	78	1.3	14.2
SD3249	47.7	61.8	27	84	1.9	15.0
STOA	47.1	58.1	31	87	1.7	14.9
SHARPSHOOTER	47.1	61.0	29	82	2.3	14.2
BUTTE 86	46.2	59.4	28	81	1.6	14.6
ERA	45.5	57.6	34	73	1.7	13.7
MT9433	43.9	59.0	32	86	3.3	14.5
CHRIS	37.6	58.1	33	93	4.4	15.1
MARQUIS	32.7	57.4	34	96	4.0	13.7

MEANS:	48.3	59.2	31	81	2.1	14.3
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TESTS	YIELD	TWT	HD	HT	LD	PROT
F-test:	30.3	30.5	99.9	81.9	6.8	4.4
LSD:	3.0	0.6	0.5	2.1	0.9	0.8
CV:	12.3	2.2	3.2	5.1	50.3	4.8

Table 3.1.

200000158

Seedling infection types of the 1996 Uniform Hard Red Spring Wheat Nursery to selected isolates of stem rust. (USDA-ARS, Cereal Rust Laboratory, University of Minnesota, St Paul, MN., 55108. by D.V. McVey)

No.	Line	HJCS	QFBS	QSHS	RKQS	RTQQ	RTQS	TPMK
1.	Marquis	0	0	2	S	;1-	1	S
2.	Chris	0	0	2	;1	0	0	0
3.	Era	0	0	1	0	0	0	;
4.	Stoa	0	0	2=c	1	;1-	0	;
5.	Butte 86	0	0	2=	2-	0	;	;
6.	SD8089	0	0	2=	2	2	1	2=
7.	SD3219	0	0	2=c	2	2=	0	;
8.	SD3236	0	0	1-c	2-	2-	;	;
9.	SD3249	0	0	2-c	2-	2	2=	;
10.	SD8108	0	0	2-c	2	2:S	23	0
11.	SBE0050	0	0	2-	0	2-	0	0
12.	MN91309	0	0	2-	0	0	0	;
13.	MN91227	0	0	1-c	;	0;	;	0
14.	MN93413	0	0	2=c	;1	;	1	0
15.	MN93434	0	0	2-c	0	2-	0	;
16.	SBF0402	0	0	;1-	0	;1	0	;1-
17.	ND691	;1-	2=	2=	2=	2-	2=	2=
18.	ND692	;1-	0	2=	;1	2=	2=	0;
19.	ND694	0	0	2=	0	2=	2=	2-
20.	ND695	0	0	2=	0	0;	2=	2=
21.	GUNNER	2-	1	2-	2=	2	2	23
22.	N92-0148	0	0	2=	0	0;	S	0
23.	N92-0126	0	0	1	0	0	0	0
24.	N92-0176	0	0	2-	0	0	0	0;
25.	N92-0434	0	;	0	;	0	;1	0
26.	MT9311	;1-	;1-	0	;	0;	2	0
27.	MT9410	1	1	2=	;1	2=	2=	1-
28.	MT9433	2=	;1-	2-	0	1c	;1	1-
29.	T1105	S	2	0	2-	2-	S	0
30.	T801.93	;1	;1	;1	;1	0	2	0
31.	SDM50005	2=	;	S	0	2=	2=	0
32.	FA994-601	0	;	1	0	2-	2=	0
33.	BW191	0	;	1	0	;1	;1	0
34.	9023-FM04C	;	2=	1	-	;1	-	0

		Sr gene				Code					Code				
Set	I	5	21	9e	7b	B	R	R	R	R	L	S	R	R	R
Set	II	11	6	8	9g	C	R	R	R	S	M	S	R	R	S
Set	III	36	9b	30	17	D	R	R	S	R	N	S	R	S	R
Set	IV	9a	9d	10	Tmp	F	R	R	S	S	P	S	R	S	S
						G	R	S	R	R	Q	S	S	R	R
						H	R	S	R	S	R	S	S	R	S
						J	R	S	S	R	S	S	S	S	R
						K	R	S	S	S	T	S	S	S	S

Pgt-race code, after Roelfs & Martens - Phytopathology 78,526-533.

Table 4. Wheat Quality Council data, 1997.

200000158

SAMPLE	CULTIVAR	TW lb/bu	LG %	SM %	1000 KWT g	SKWCS			WHEAT KER				WHT PRO 14%mb %	WHT ASH 14%mb %	DON ppm	
						A	B	C	D	HARD INDEX	MOIST %	WEIGHT mg				MOIST %
B-1	Grandin	60.7	84	1	35.8	000-003-016-081	70.3	11.1	33.6	10.1	38.5	76.4	402	15.02	1.569	0
B-13	Grandin	61.3	83	1	36.8	002-009-029-060	63.8	11.0	36.3	9.7	33.0	79.9	371	15.81	1.562	0
C-1	Grandin	60.9	74	1	30.8	000-001-009-090	75.5	11.4	28.7	10.1	75.8	84.4	352	15.50	1.818	3.6
C-13	Grandin	60.1	65	3	29.3	001-004-017-078	69.8	10.7	29.1	9.7	63.1	77.1	324	16.00	1.933	3.7
K-1	Grandin	59.5	76	2	31.3	000-005-014-081	69.7	11.9	30.5	10.4	54.7	80.4	266	15.74	1.824	10.4
K-13	Grandin	59.4	75	2	35.5	001-004-024-071	66.6	12.2	32.6	10.4	71.2	79.3	323	15.26	1.756	6.4
M-1	Grandin	59.5	79	1	33.7	000-003-016-081	70.5	12.5	32.4	10.5	54.1	83.6	334	15.85	1.461	0.8
M-13	Grandin	59.5	78	1	33.6	001-004-019-076	67.9	12.5	32.0	10.4	54.6	81.7	339	15.74	1.440	0.6
AVERAGE		60.1	76.8	1.5	33.4		69.3	11.7	31.9	10.2	55.6	80.4	338.9	15.62	1.670	3.19
K-10	MN93413	59.9	57	3	31.3	002-005-020-073	66.1	12.0	29.6	10.1	56.3	74.2	301	14.54	1.751	5.5
M-10	MN93413	58.9	45	3	31.1	000-004-012-084	71.6	12.3	31.4	10.2	48.4	84.2	368	13.50	1.350	0
AVERAGE		59.4	51.0	3.0	31.2		68.9	12.2	30.5	10.2	52.4	79.2	335	14.02	1.550	2.8
C-11	N92-0434	60.7	64	2	30.5	003-007-022-068	64.0	11.2	31.3	9.7	53.6	62.3	319	14.48	1.848	2.2
K-11	N92-0434	59.9	76	1	36.1	001-006-021-072	66.1	12.3	33.2	10.4	56.3	81.6	291	15.07	1.708	7.4
M-11	N92-0434	59.8	68	1	33.4	001-002-023-074	69.6	12.3	31.1	10.4	38.3	71.3	333	15.17	1.401	0
AVERAGE		60.1	69.3	1.3	33.3		66.6	11.9	31.9	10.2	49.4	71.7	314.3	14.9	1.7	3.2
B-12	N93-0136	61.5	80	1	32.8	004-018-036-042	56.4	11.1	33.4	9.9	18.7	79.8	390	14.13	1.346	0
C-12	N93-0136	61.9	63	3	29.5	004-008-028-060	62.7	11.1	29.0	9.9	49.4	74.4	324	12.79	1.823	2.7
M-12	N93-0136	60.9	50	2	28.9	002-004-017-077	71.4	12.3	28.6	10.1	45.9	61.3	373	13.87	1.416	0
AVERAGE		61.4	64.3	2.0	30.4		63.5	11.5	30.3	10.0	38.0	71.8	362.3	13.6	1.5	0.9
M-2	ND691	59.4	35	5	26.5	000-001-007-092	81.6	12.8	26.5	10.5	57.2	82.4	378	14.80	1.422	0.3
B-3	ND694	61.9	70	2	31	000-002-007-091	76.0	11.1	29.4	10.1	91.5	71.9	402	15.50	1.464	0
C-3	ND694	62.2	54	3	26.8	000-004-014-082	74.6	10.8	26.9	9.7	93.2	77.8	361	15.33	1.857	1.2
M-3	ND694	61.0	60	2	29.8	002-004-010-084	74.0	12.3	28.0	10.5	79.6	87.9	364	15.95	1.240	1.0
AVERAGE		61.7	61.3	2.3	29.2		74.9	11.4	28.1	10.1	88.1	79.2	375.7	15.6	1.5	0.7
C-4	ND695	61.0	54	3	27.2	002-003-017-078	68.7	10.6	27.0	9.6	78.0	69.2	353	15.32	1.922	3.2
M-4	ND695	61.1	71	1	31.7	000-012-023-065	63.0	12.1	30.8	10.4	58.0	71.1	352	15.74	1.277	0.8
AVERAGE		61.1	62.5	2.0	29.5		65.9	11.4	28.9	10.0	68.0	70.2	352.5	15.5	1.6	2.0
C-9	SBE0050	60.2	31	6	26.5	001-006-019-074	67.6	10.6	26.1	9.4	72.3	64.8	370	14.24	1.927	1.0
K-9	SBE0050	59.7	65	3	33.4	002-006-016-076	67.6	11.9	32.8	10.3	39.8	76.7	354	13.23	1.735	4.2
M-9	SBE0050	60.3	51	2	31.7	000-004-015-081	71.9	12.0	29.8	10.0	52.1	60.3	342	15.10	1.386	0
AVERAGE		60.0	49.0	3.7	30.5		69.0	11.5	29.6	9.9	54.7	67.3	355.3	14.2	1.7	1.7
B-7	SD3219	62.5	72	2	33.4	001-002-012-085	72.6	11.3	32.4	9.8	28.2	78.4	379	14.02	1.402	0
B-5	SD3249	63.4	80	1	33.8	001-005-028-066	64.5	10.9	32.9	9.9	68.1	85.3	387	16.51	1.575	0
C-5	SD3249	62.7	52	3	28.6	001-007-021-071	65.8	10.5	28.3	9.6	87.9	74	371	15.51	1.922	1.9
K-5	SD3249	59.9	56	4	29.6	002-007-027-064	63.7	11.9	28.9	10.4	50.5	61.5	322	15.17	1.872	7.6
M-5	SD3249	61.9	72	1	31.3	002-018-036-044	57.6	12.2	30.4	10.4	62.3	77.7	324	16.41	1.363	0
AVERAGE		62.0	65.0	2.3	30.8		62.9	11.4	30.1	10.1	67.2	74.6	351.0	15.9	1.7	2.4
B-6	SD8108	62.4	78	1	34.5	003-012-038-047	58.5	11.2	33.4	9.9	39.9	55.9	393	14.79	1.470	0
B-8	Sharpshooter	62.1	78	1	34.8	002-013-035-050	59.3	11.2	32.9	9.7	15.6	72.8	400	14.76	1.590	0
C-8	Sharpshooter	61.9	49	5	28.5	004-011-029-056	60.9	10.8	26.7	9.7	72.2	69.7	364	14.76	1.771	2.6
K-8	Sharpshooter	60.8	69	3	31.1	001-011-035-053	61.4	12.0	29.0	10.1	38.4	75.9	356	14.54	1.827	4.2
M-8	Sharpshooter	62.6	79	1	34.6	003-009-026-062	63.1	12.1	30.8	10.2	65.1	69.4	339	15.13	1.350	0.6
AVERAGE		61.9	68.8	2.5	32.3		61.2	11.5	29.9	9.9	47.8	72.0	365	14.80	1.635	1.9

Table 4 contd...

200000158

SAMPLE	CULTIVAR/ EXPERIMENTAL	PERCENT FLOUR EXTRACTION					MILLING VALUE			
		Short Patent	1st Clear	Total	2nd Clear	Feed	Patent (\$10/cwt)	Clear (\$8/cwt)	Feed (\$5/cwt)	Gross MV
B-ck	Grandin	68.6	2.6	71.2	4.0	24.9	\$ 6.86	\$ 0.52	\$ 1.24	\$ 8.63
C-ck	Grandin	68.7	3.2	71.9	3.3	24.8	\$ 6.87	\$ 0.52	\$ 1.24	\$ 8.63
K-ck	Grandin	66.6	5.0	71.6	3.5	25.0	\$ 6.66	\$ 0.68	\$ 1.25	\$ 8.58
M-ck	Grandin	72.0	0.9	72.9	3.3	23.8	\$ 7.20	\$ 0.34	\$ 1.19	\$ 8.73
	AVERAGE	69.0	2.9	71.9	3.5	24.6	\$ 6.90	\$ 0.51	\$ 1.23	\$ 8.64
K-10	MN93413	62.0	9.5	71.4	4.0	24.6	\$ 6.20	\$ 1.08	\$ 1.23	\$ 8.50
M-10	MN93413	53.0	19.0	72.0	3.8	24.2	\$ 5.30	\$ 1.83	\$ 1.21	\$ 8.34
	AVERAGE	57.5	14.2	71.7	3.9	24.4	\$ 5.75	\$ 1.45	\$ 1.22	\$ 8.42
C-11	N92-0434	61.5	8.0	69.5	4.3	26.2	\$ 6.15	\$ 0.99	\$ 1.31	\$ 8.45
K-11	N92-0434	69.2	2.3	71.5	4.4	24.1	\$ 6.92	\$ 0.54	\$ 1.21	\$ 8.66
M-11	N92-0434	70.0	0.0	70.0	4.1	25.9	\$ 7.00	\$ 0.33	\$ 1.29	\$ 8.62
	AVERAGE	66.9	3.5	70.4	4.3	25.4	\$ 6.69	\$ 0.62	\$ 1.27	\$ 8.58
B-12	N93-0136	72.6	0.0	72.6	3.0	24.4	\$ 7.26	\$ 0.24	\$ 1.22	\$ 8.72
C-12	N93-0136	66.3	6.7	73.0	3.0	24.0	\$ 6.63	\$ 0.78	\$ 1.20	\$ 8.60
M-12	N93-0136	70.8	0.9	71.7	3.3	25.1	\$ 7.08	\$ 0.33	\$ 1.25	\$ 8.66
	AVERAGE	69.9	2.5	72.4	3.1	24.5	\$ 6.99	\$ 0.45	\$ 1.22	\$ 8.66
M-2	ND691	59.1	9.3	68.4	5.1	26.5	\$ 5.91	\$ 1.15	\$ 1.32	\$ 8.39
B-3	ND694	69.7	0.0	69.7	5.1	25.2	\$ 6.97	\$ 0.41	\$ 1.26	\$ 8.64
C-3	ND694	67.8	0.0	67.8	5.5	26.7	\$ 6.78	\$ 0.44	\$ 1.34	\$ 8.55
M-3	ND694	71.6	0.0	71.6	2.9	25.5	\$ 7.16	\$ 0.23	\$ 1.28	\$ 8.67
	AVERAGE	69.7	0.0	69.7	4.5	25.8	\$ 6.97	\$ 0.36	\$ 1.29	\$ 8.62
C-4	ND695	67.7	1.1	68.8	4.4	26.9	\$ 6.77	\$ 0.44	\$ 1.34	\$ 8.55
M-4	ND695	69.1	0.0	69.1	5.2	25.7	\$ 6.91	\$ 0.41	\$ 1.29	\$ 8.61
	AVERAGE	68.4	0.6	68.9	4.8	26.3	\$ 6.84	\$ 0.43	\$ 1.31	\$ 8.58
C-9	SBE0050	56.7	14.0	70.8	3.2	26.0	\$ 5.67	\$ 1.38	\$ 1.30	\$ 8.35
K-9	SBE0050	65.7	7.5	73.1	3.9	23.0	\$ 6.57	\$ 0.91	\$ 1.15	\$ 8.62
M-9	SBE0050	70.6	0.0	70.6	4.0	25.4	\$ 7.06	\$ 0.32	\$ 1.27	\$ 8.65
	AVERAGE	64.3	7.2	71.5	3.7	24.8	\$ 6.43	\$ 0.87	\$ 1.24	\$ 8.54
B-7	SD3219	71.3	0.0	71.3	4.5	24.2	\$ 7.13	\$ 0.36	\$ 1.21	\$ 8.70
B-5	SD3249	71.8	0.0	71.8	4.6	23.7	\$ 7.18	\$ 0.36	\$ 1.18	\$ 8.72
C-5	SD3249	70.0	0.0	70.0	3.6	26.4	\$ 7.00	\$ 0.29	\$ 1.32	\$ 8.61
K-5	SD3249	67.6	1.2	68.8	3.6	27.5	\$ 6.76	\$ 0.39	\$ 1.38	\$ 8.53
M-5	SD3249	71.3	0.0	71.3	4.6	24.2	\$ 7.13	\$ 0.36	\$ 1.21	\$ 8.70
	AVERAGE	70.2	0.3	70.5	4.1	25.4	\$ 7.02	\$ 0.35	\$ 1.27	\$ 8.64
B-6	SD8108	71.7	0.0	71.7	3.5	24.9	\$ 7.17	\$ 0.28	\$ 1.24	\$ 8.69
B-8	Sharpshooter	71.9	0.0	71.9	3.4	24.7	\$ 7.19	\$ 0.27	\$ 1.23	\$ 8.70
C-8	Sharpshooter	70.9	0.0	70.9	3.4	25.7	\$ 7.09	\$ 0.27	\$ 1.28	\$ 8.65
K-8	Sharpshooter	70.9	1.0	71.9	3.4	24.8	\$ 7.09	\$ 0.35	\$ 1.24	\$ 8.68
M-8	Sharpshooter	72.6	0.0	72.6	3.6	23.7	\$ 7.26	\$ 0.29	\$ 1.19	\$ 8.74
	AVERAGE	71.6	0.2	71.8	3.5	24.7	\$ 7.16	\$ 0.30	\$ 1.24	\$ 8.69

Table 4 contd...

200000158

SAMPLE	CULTIVAR/ EXPERIMENTAL	FLOUR MOISTURE	FLOUR PROTEIN	FLOUR ASH	FARINOGRAPH DATA				
		%	14%mb	14%mb	WA 14%mb	PT min	Stab min	MTI BU	TTB min
B-ck	Grandin	14.1	14.52	0.401	62.7	8.7	25.0	9.0	27.5
C-ck	Grandin	13.7	14.24	0.457	61.6	6.0	8.9	33.0	10.3
K-ck	Grandin	14.2	14.14	0.411	61.7	5.2	8.6	29.0	10.6
M-ck	Grandin	13.6	14.72	0.408	61.6	9.8	32.6	12.0	36.0
	AVERAGE	13.9	14.41	0.419	61.9	7.4	18.8	20.8	21.1
K-10	MN93413	13.4	13.11	0.437	58.6	7.1	10.7	32.0	11.6
M-10	MN93413	14.0	12.59	0.430	60.1	6.5	12.4	25.0	12.1
	AVERAGE	13.7	12.85	0.433	59.4	6.8	11.6	28.5	11.9
C-11	N92-0434	13.6	12.84	0.438	59.8	5.7	9.8	23.0	11.6
K-11	N92-0434	13.2	13.57	0.436	60.8	7.1	9.2	39.0	10.8
M-11	N92-0434	14.0	14.20	0.400	62.7	13.3	21.2	11.0	26.0
	AVERAGE	13.6	13.54	0.425	61.1	8.7	13.4	24.3	16.1
B-12	N93-0136	14.1	13.31	0.380	60.0	7.9	17.8	4.0	23.5
C-12	N93-0136	13.8	11.67	0.439	57.8	4.5	7.0	38.0	8.4
M-12	N93-0136	13.5	12.92	0.407	59.3	13.0	16.8	6.0	20.0
	AVERAGE	13.8	12.63	0.409	59.0	8.5	13.9	16.0	17.3
M-2	ND691	13.8	13.87	0.449	61.3	11.8	26.0	13.0	30.5
B-3	ND694	13.7	14.94	0.388	62.8	8.9	23.6	10.0	26.0
C-3	ND694	14.1	13.81	0.420	61.6	6.2	9.9	31.0	10.6
M-3	ND694	12.7	15.18	0.404	62.4	9.9	16.1	20.0	18.2
	AVERAGE	13.5	14.64	0.404	62.3	8.3	16.5	20.3	18.3
C-4	ND695	14.9	13.75	0.404	62.0	6.7	8.0	43.0	10.1
M-4	ND695	13.1	14.65	0.346	61.4	10.9	15.6	13.0	20.0
	AVERAGE	14.0	14.20	0.375	61.7	8.8	11.8	28.0	15.1
C-9	SBE0050	14.2	12.92	0.483	58.3	7.4	11.8	32.0	12.1
C-9	SBE0050	13.8	12.06	0.439	59.2	5.5	7.7	48.0	8.9
M-9	SBE0050	14.2	13.93	0.391	60.7	15.4	24.3	9.0	29.0
	AVERAGE	14.0	12.97	0.437	59.4	9.4	14.6	29.7	16.7
-7	SD3219	12.8	13.12	0.414	58.4	3.3	18.2	9.0	20.0
-5	SD3249	13.2	15.65	0.386	63.7	10.6	16.6	15.0	19.4
-5	SD3249	14.0	14.00	0.380	61.3	6.4	10.1	23.0	12.5
-5	SD3249	14.2	13.74	0.401	60.2	6.5	10.1	37.0	10.8
-5	SD3249	13.2	15.25	0.357	61.1	9.8	13.2	30.0	14.7
	AVERAGE	13.6	14.66	0.381	61.6	8.3	12.5	26.3	14.4
-6	SD8108	13.0	13.75	0.356	59.5	5.9	28.6	16.0	30.5
-8	Sharpshooter	14.0	13.81	0.340	61.1	9.4	12.8	27.0	14.8
-8	Sharpshooter	14.2	13.43	0.391	60.6	4.2	4.9	46.0	7.2
-8	Sharpshooter	14.1	13.21	0.410	59.7	5.9	7.4	37.0	9.8
-8	Sharpshooter	13.8	14.27	0.359	61.1	6.7	8.5	29.0	12.0
	AVERAGE	14.0	13.68	0.375	60.6	6.6	8.4	34.8	11.0

Table 4 contd....

Cultivar	Sample	Bake Absorption	Mix Time	Mix Tolerance	Dough Out Mixer	Dough at Makeup	Loaf Volume	Crumbs Color	Crumbs Grain	Crumbs Texture	Overall Bake Score
Grandin	Bek	4.3 1.2	4.9 1.2	5.2 1.1	3.6 1.7	3.3 1.8	4.8 0.9	5.0 1.0	3.9 1.5	4.4 0.9	4.8 0.7
ND694	B3	4.4 1.2	4.9 1.3	5.1 0.8	3.7 1.8	2.9 1.8	4.6 1.2	4.7 0.9	3.3 1.0	4.2 1.1	4.3 0.7
SD3249	B5	4.7 1.1	4.8 1.3	4.8 1.1	3.7 1.9	2.8 1.6	4.9 1.1	4.8 1.0	3.6 1.2	4.2 1.1	4.4 0.6
SD8108	B6	3.4 1.6	5.2 1.3	4.8 1.5	3.0 1.7	2.3 1.2	3.4 1.7	4.6 1.1	3.7 1.0	3.9 1.0	3.4 1.1
SD3219	B7	2.5 1.3	5.0 1.2	4.3 1.5	3.0 1.7	2.8 1.5	3.2 1.5	4.3 1.2	4.2 1.1	3.9 0.8	3.2 1.2
Sharpshooter	B8	3.2 1.1	4.5 1.4	4.6 1.3	3.6 1.8	3.4 1.5	4.0 1.1	5.0 1.0	4.3 1.2	4.2 1.0	4.0 1.1
N93-0136	B12	2.8 1.2	4.5 1.4	4.9 1.1	3.7 1.9	3.3 1.7	4.1 0.9	4.9 1.0	4.3 1.2	4.4 0.9	4.1 1.4
Grandin	Cck	3.6 1.2	4.1 1.3	4.1 1.2	4.2 1.8	4.3 1.6	4.8 0.9	4.4 1.1	4.2 1.4	4.1 1.1	4.4 0.4
ND694	C3	3.6 0.9	3.6 1.5	3.8 1.3	4.1 1.4	4.2 1.5	4.3 1.3	4.3 1.3	3.5 1.2	4.1 1.2	4.1 0.5
ND695	C4	3.4 0.8	2.6 1.5	3.4 1.3	3.6 1.4	3.8 1.4	3.5 1.1	3.5 1.4	2.9 0.9	3.4 1.2	3.3 0.7
SD3249	C5	3.6 1.1	3.6 1.8	3.5 1.5	3.7 1.5	3.5 1.4	4.4 1.8	4.5 1.0	4.3 0.9	4.1 1.3	4.0 0.8
Sharpshooter	C8	2.8 1.1	1.9 1.0	2.3 1.3	3.7 1.4	3.5 1.5	3.9 1.5	4.3 1.3	3.6 1.1	3.7 1.3	3.4 0.8
SBE0050	C9	2.6 1.1	4.0 1.8	3.7 1.3	3.7 1.6	3.8 1.6	4.2 1.4	4.6 1.0	4.2 1.1	4.1 0.8	3.8 0.9
N92-0434	C11	2.9 1.0	3.5 1.8	3.6 1.6	4.1 1.7	3.8 1.5	4.7 1.1	4.5 0.7	3.9 1.0	4.0 1.1	4.0 0.7
N93-0136	C12	2.0 1.0	2.7 1.2	2.6 0.7	4.0 1.5	3.7 1.3	3.4 1.3	4.3 1.0	4.1 1.0	3.7 0.9	3.1 0.9
Grandin	Kek	3.2 1.4	3.1 1.6	3.6 1.7	3.7 1.5	3.6 1.4	4.1 1.4	3.8 1.0	3.0 1.0	3.4 1.4	3.8 0.8
SD3249	K5	2.8 1.0	3.1 1.3	3.2 1.0	3.7 1.6	3.6 1.4	3.8 1.7	3.4 1.3	2.8 1.0	3.4 1.3	3.3 0.7
Sharpshooter	K8	2.5 1.4	2.7 1.7	3.0 1.7	3.1 1.5	3.2 1.6	3.3 1.5	3.8 1.2	3.0 1.3	3.4 1.3	3.1 0.7
SBE0050	K9	2.4 1.1	2.6 1.4	2.7 1.1	4.2 1.5	4.0 1.5	3.5 1.3	3.8 1.3	3.4 1.3	3.5 1.3	3.2 0.9
MN93413	K10	2.5 1.1	3.4 1.4	3.8 1.3	4.0 1.3	4.3 1.1	3.9 1.4	4.2 1.3	3.6 1.5	3.8 1.3	3.6 1.0
N92-0434	K11	3.3 1.2	3.1 1.3	3.9 1.5	4.1 1.4	4.2 1.2	3.9 1.7	3.4 1.3	3.0 1.1	3.5 1.5	3.5 0.7
Grandin	Mck	4.0 1.2	4.7 1.6	4.9 1.4	3.6 1.9	3.4 2.0	4.8 1.6	4.7 0.9	3.6 1.1	4.0 1.3	4.6 0.6
ND691	M2	3.6 1.2	4.9 1.4	5.0 1.1	3.5 1.9	2.9 1.6	3.5 1.4	3.8 0.9	3.3 1.0	3.8 1.2	3.9 0.5
ND694	M3	4.0 1.2	4.4 1.5	4.4 1.2	3.5 1.7	3.6 1.7	4.4 1.7	4.5 0.7	3.0 0.8	3.5 1.4	4.1 0.8
ND695	M4	3.4 1.1	3.6 1.7	4.1 1.3	3.8 1.4	3.8 1.7	4.3 1.6	4.2 0.9	2.6 0.7	3.6 1.7	3.7 0.6
SD3249	M5	3.4 1.0	4.5 1.4	4.5 1.1	4.0 1.8	3.5 1.6	4.7 1.5	4.9 1.1	4.3 1.5	4.4 1.4	4.4 0.9
Sharpshooter	M8	3.4 1.0	3.1 1.0	3.1 1.3	3.8 1.4	4.0 1.2	3.5 1.7	4.3 1.1	3.0 0.7	3.7 1.3	3.4 0.7
SBE0050	M9	3.4 1.0	4.6 1.6	5.1 0.9	3.7 1.7	3.6 1.5	4.1 1.5	4.8 1.0	3.9 1.4	4.2 1.3	4.3 0.6
MN93413	M10	3.3 1.0	3.9 1.6	3.8 1.2	3.8 1.3	3.4 1.3	3.0 1.3	4.5 1.0	4.1 1.2	4.2 1.3	3.8 0.6
N92-0434	M11	4.2 1.0	4.9 1.5	5.1 0.9	3.7 1.8	3.5 1.7	4.2 1.5	4.6 0.8	3.5 1.1	3.9 1.4	4.1 0.4
N93-0136	M12	2.8 1.3	4.2 1.6	4.9 0.9	4.0 1.7	4.1 1.2	4.0 1.4	4.6 0.7	3.5 1.2	4.0 1.5	3.8 0.7

Means (+/- standard deviation) of bread baking scores submitted by bake cooperators (11 cooperators)

Table 5. Wheat Quality Council data, 1998.

Flour and Dough Characteristics

		Flour Characteristics					Farinograph Characteristics					
		Flour		Flour		Flour	Water	Peak Mix	Dough	MTI	Time to	
		Moisture	Ash	Ash	Protein	Protein	Absorption	Time	Stability	(bu)	Breakdown	
				(14%mb)	(14%mb)	(14%mb)	(14%mb)	(min)	(min)		(min)	
BROOKINGS	B-1	Grandin	13.5	0.553	0.550	14.21	14.13	59.6	5.5	9.6	36	9.8
	B-2	N93-0119	13.3	0.590	0.585	13.27	13.16	60.6	6.0	8.7	30	10.3
	B-3	ND694	13.4	0.552	0.548	13.19	13.10	59.6	6.0	10.2	30	10.9
	B-4	ND695	13.0	0.477	0.472	12.95	12.80	58.2	6.0	11.3	26	11.6
	B-5	SD3219	12.9	0.533	0.526	12.36	12.20	57.2	5.0	10.4	28	10.1
	B-6	SD8108	12.9	0.455	0.449	12.81	12.65	57.9	4.0	11.2	24	9.3
	B-7	SD3310	13.0	0.374	0.370	13.51	13.35	57.0	10.9	17.7	11	20.0
CASSELTON	C-1	Grandin	14.0	0.449	0.449	14.55	14.55	60.8	7.6	14.2	21	14.1
	C-2	N93-0119	13.8	0.457	0.456	13.65	13.62	61.8	7.2	9.6	28	12.8
	C-3	ND694	13.6	0.433	0.431	14.48	14.41	61.2	6.2	11.7	23	13.5
	C-4	ND695	13.3	0.473	0.469	14.40	14.28	60.1	10.1	14.5	19	18.6
	C-5	SD3219	13.3	0.435	0.431	14.00	13.89	58.0	7.1	14.3	20	14.7
	C-6	SD8108	13.5	0.381	0.379	13.13	13.05	58.0	7.6	17.4	14	16.9
	C-8	MN93413	13.2	0.464	0.460	12.83	12.71	58.3	5.7	10.1	30	9.9
	C-9	MN94055	13.3	0.417	0.414	12.53	12.43	58.2	5.5	6.4	37	9.4
CROOKSTON	K-1	Grandin	13.0	0.466	0.461	14.70	14.53	60.8	6.7	9.6	30	11.6
	K-2	N93-0119	12.6	0.500	0.492	13.73	13.51	61.4	6.7	6.8	47	9.1
	K-5	SD3219	12.8	0.467	0.461	13.75	13.56	59.4	5.2	8.8	30	10.1
	K-8	MN93413	12.5	0.492	0.484	13.46	13.23	59.4	6.2	6.9	52	9.1
	K-9	MN94055	12.6	0.474	0.466	13.30	13.09	59.0	5.9	6.9	36	9.8
MINOT	M-1	Grandin	14.0	0.482	0.482	15.35	15.35	62.1	7.6	17.4	9	20.0
	M-2	N93-0119	14.4	0.476	0.478	14.42	14.49	63.7	12.8	39.0	8	35.0
	M-3	ND694	14.2	0.430	0.431	14.86	14.89	61.9	19.8	15.8	2	33.0
	M-4	ND695	13.1	0.468	0.463	15.15	14.99	60.4	9.9	16.6	17	20.0
	M-5	SD3219	12.9	0.484	0.478	14.24	14.06	58.6	7.7	17.5	14	17.9
	M-9	MN94055	12.6	0.512	0.504	14.92	14.68	59.6	9.1	23	18	20.0

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

2. TEMPORARY DESIGNATION
OR EXPERIMENTAL NUMBER

SD 3219

3. VARIETY NAME

Ember

4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)

SOUTH DAKOTA STATE UNIVERSITY
AG HALL 129
BROOKINGS, SD 57007

5. TELEPHONE (include area code)
(605) 688-4149

6. FAX (include area code)
(605) 688-6065

7. PVPO NUMBER

2000001587

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain.

☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company?
If no, give name of country

☒ YES ☐ NO

10. Is the applicant the original breeder? If no, please answer the following:

a. If original rights to variety were owned by individual(s):

Is (are) the original breeder(s) a U.S. national(s)? If no, give name of country

☒ YES ☐ NO

b. If original rights to variety were owned by a company:

Is the original breeder(s) U.S. based company? If no, give name of country

☐ YES ☐ NO

11. Additional explanation on ownership (If needed, use reverse for extra space):

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
 2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
 3. If the applicant is an owner who is not the original breeder, both the original breeder and the applicant must meet one of the above criteria.
- The original breeder may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

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